550094

NEWARK PUBLIC LIBRARY
APR 14 1981
U. S. GOVT. PUBS.
DEPOSITORY 376

FLOOD INSURANCE STUDY

COUNTY OF DODGE, WISCONSIN

UNINCORPORATED AREAS

DECEMBER 15, 1980

federal emergency management agency
federal insurance administration

COMMUNITY NUMBER - 550094

FEM 1.209:

TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
1.1	Purpose of Study	1
1.2	Authority and Acknowledgements	1
1.3	Coordination	1
2.0	AREA STUDIED	2
2.1	Scope of Study	2
2.2	Community Description	4
2.3	Principal Flood Problems	5
2.4	Flood Protection Measures	5
3.0	ENGINEERING METHODS	5
3.1	Hydrologic Analyses	6
3.2	Hydraulic Analyses	7
4.0	FLOOD PLAIN MANAGEMENT APPLICATIONS	11
4.1	Flood Boundaries	11
4.2	Floodways	12
5.0	INSURANCE APPLICATION	16
5.1	Reach Determinations	16
5.2	Flood Hazard Factors	17
5.3	Flood Insurance Zones	17
5.4	Flood Insurance Rate Map Description	18

TABLE OF CONTENTS (Continued)

		Page
6.0	OTHER STUDIES	18
7.0	LOCATION OF DATA	21
8.0	REFERENCES AND BIBLIOGRAPHY	21

FIGURES

Figure 1 -	Vicinity Map	3
Figure 2 -	Floodway Schematic	16

TABLES

Table 1 -	Summary of Discharges	8
Table 2 -	Summary of Elevations	10
Table 3 -	Floodway Data	13
Table 4 -	Flood Insurance Zone Data	19

EXHIBITS

Exhibit 1 - Flood Profiles

Rock River	Panels	01P - 02P
East Branch Rock River	Panels	03P - 04P
Crawfish River	Panels	05P - 07P
Maunesha River	Panel	08P
Silver Creek	Panel	09P
Davy Creek	Panel	10P

Exhibit 2 - Flood Boundary and Floodway Map Index
Flood Boundary and Floodway Map

PUBLISHED SEPARATELY:

Flood Insurance Rate Map Index
Flood Insurance Rate Map

FLOOD INSURANCE STUDY

COUNTY OF DODGE, WISCONSIN
UNINCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Unincorporated Areas of Dodge County, Wisconsin, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert the County of Dodge to the regular program of flood insurance by the Federal Insurance Administration (FIA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally-supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 44 CFR, 60.1 (d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgements

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by the U.S. Geological Survey for the Federal Insurance Administration, under Inter-Agency Agreement No. IAA-H-9-N, Project Order No. 25. This study was completed in June 1979.

1.3 Coordination

Streams to be studied by detailed or approximate methods were identified at an initial coordination and time and cost meeting on December 21, 1976. Flood elevations, flood boundaries, and floodway delineations were coordinated with the County Surveyor, the Wisconsin Department of Natural Resources (WDNR), and the Dodge County Zoning Administrator. Base maps were obtained from the Wisconsin Geological and Natural History Survey, University of Wisconsin Extension.

On June 10, 1980, the results of the work by the Study Contractor were reviewed and accepted at a final coordination meeting attended by representatives of the FIA, the U.S. Geological Survey (USGS), the WDNR, the Dodge County Planning Commission, and the community. Approximate flood boundaries were revised to conform with county Zoning Maps in response to concerns raised by county officials at the meeting.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the unincorporated areas of Dodge County, Wisconsin. The incorporated areas within the county were excluded from this study. The area of study is shown on the Vicinity Map (Figure 1).

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, and areas of projected development or proposed construction through June 1979.

Approximate methods of analysis were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to and agreed upon by the FIA and the County of Dodge.

The flooding sources studied by detailed methods are listed below:

a. Davy Creek, from a point 1.2 miles downstream of Lincoln Road to State Highway 67;

b. the Rock River, from the Horicon corporate limits to County Highway S, and from the Hustisford corporate limits to State Highway 60;

c. East Branch Rock River, from a point approximately 1,500 feet downstream of the Theresa corporate limits to the Theresa corporate limits and from the Mayville extraterritorial limits upstream to Gill Road;

d. Fox Lake, the entire shoreline, within Dodge County;

e. Sinissippi Lake, the shoreline at County Highway S downstream to the Hustisford city limit;

f. the Crawfish River, from the county boundary upstream to State Highway 73;

g. the Maunesha River, from Waterloo corporate limit at the county line to a point 0.34 mile upstream of State Highway 19;

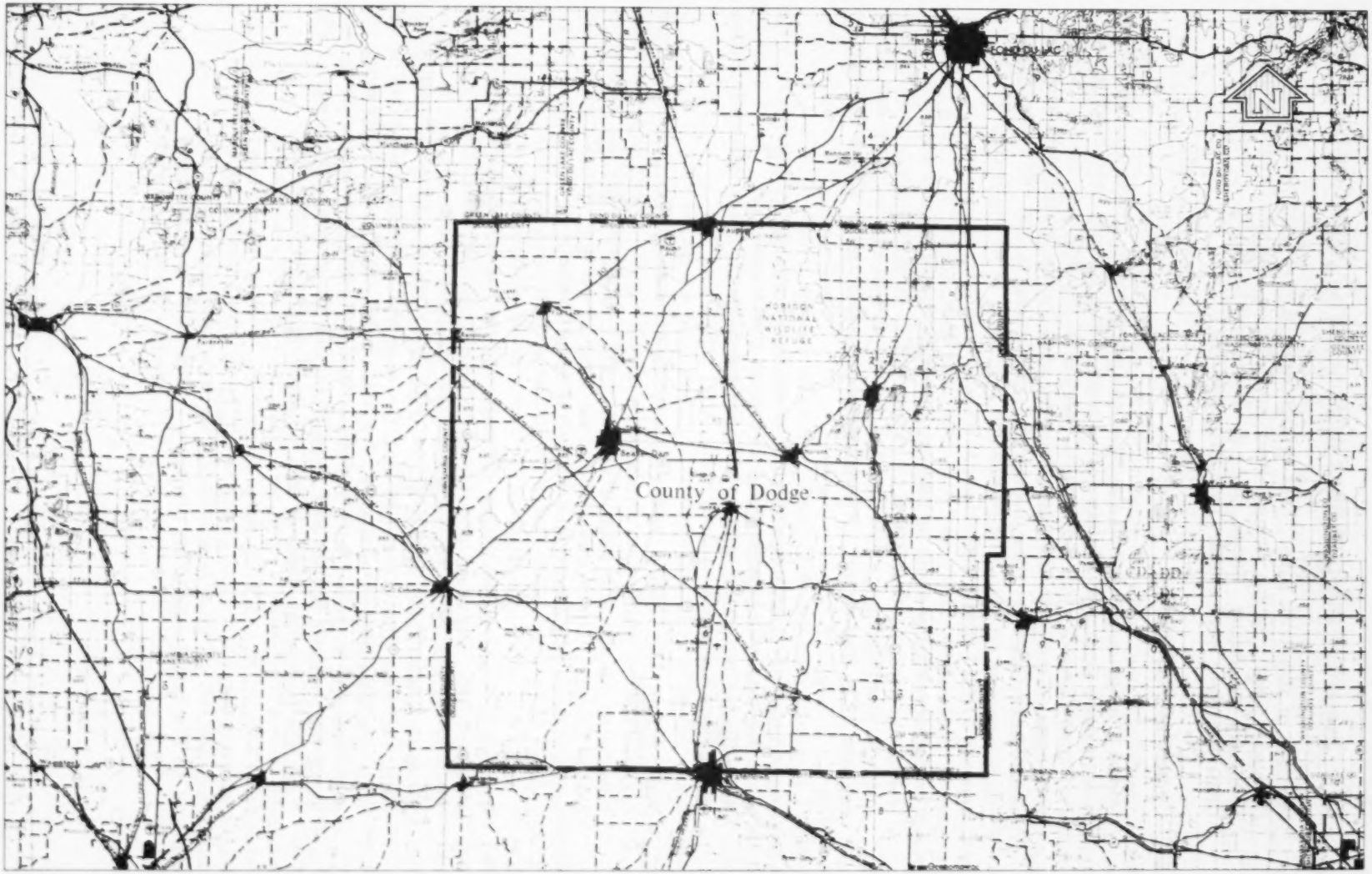


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF DODGE, WI
(UNINCORPORATETED AREAS)

APPROXIMATE SCALE
8 0 8 16 24 MILES

VICINITY MAP

h. Silver Creek, from the Watertown corporate limit to a point 0.25 mile upstream of U.S. Highway 16; and

i. Beaverdam Lake, the entire shoreline, within Dodge County.

Portions of the Rock River, East Branch Rock River, Unnamed Tributary to Crystal Creek, Spring Brook, Woodland Creek, Butler Creek, Unnamed Tributary to Butler Creek, the Rubicon River, Silver Creek, and the Crawfish River were studied by approximate methods.

2.2 Community Description

Dodge County is located in the southeastern part of Wisconsin. Adjacent counties are Columbia County to the west, Dane County to the southwest, Jefferson County to the south, Waukesha County to the southeast, Washington County to the east, Fond du Lac County to the northeast, and Green Lake County to the northwest. According to the 1970 Census, the population was 69,004. The population increased to an estimated 74,117 by January 1, 1978 (Reference 1).

Temperatures range from an average monthly high of 71 degrees Fahrenheit (F.) to an average monthly low of 61 degrees F. in the summer, and from an average monthly high of 32 degrees F. to an average monthly low of 18 degrees F. in the winter. The annual precipitation is 30 inches (Reference 2).

The topography of Dodge County consists of gently rolling plains with extensive marshland areas along the major rivers and lakes. As in most of southeastern Wisconsin, glacial activity has been the most influential force shaping the landscape.

Soils within this region result mostly from atmospheric, chemical, and organic forces working to modify the glacial drift. Soils are generally classed as upland silt loam (Reference 3). Approximately 65 percent of Dodge County is in cropland and more than 10 percent consists of pasture and woodlots (Reference 4). Wetlands cover a moderate area along major rivers.

The Rock River is the major drainage feature of the eastern half of the county. The mainstem and the east branch of the river drain into the Horicon Marsh area. Downstream from Horicon, the river spreads out to form Sinissippi Lake, ending at the Village of Hustisford dam. From the dam, the river flows south to exit the county. The Crawfish River is the main drainage feature of the western half of the county. It enters along the southwestern boundary with Columbia County and flows southeast to exit along the southern border with Jefferson County. It drains the areas of Fox Lake and Beaverdam Lake as well as areas adjacent to the river.

The major land use in Dodge County is agriculture, with corn and rotation crops being prevalent. Most of the development is concentrated in or near the incorporated areas of the county. There is little development in the flood plains outside of the incorporated areas of Dodge County. Most of the flood plains are either marshy lowlands or devoted to agriculture.

2.3 Principal Flood Problems

Runoff from a combination of snowmelt and rainfall on frozen (impervious) ground and intense thunderstorms are significant factors affecting flooding. The principal flooding problems occur along the lower reaches of the Rock River where backwater flooding can be extensive. However, most of the land inundated is agricultural, and flooding does not create damage to residential or commercial property. Low-lying roads are often inundated.

Drained marshes and lowlands are flooded in the event of any major storm. These areas will not drain until the main watercourses (Rock River or Crawfish River) lower their stage enough to allow drainage from the lowlands.

2.4 Flood Protection Measures

There are no structural flood protection measures in Dodge County. The numerous small dams along the various rivers are primarily upstream water-level-control structures and are insignificant for flood protection. Many of the county residents believe that the dams along the Rock River at Horicon and Hustisford have some usefulness as flood protection structures. These dams were not designed as such, and there is no operating policy to use them in such a manner at this time.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one percent chance of annual occurrence) in any 50-year period is about 40 percent (four in ten), and for any 90-year period, the risk increases to about 60 percent (six in ten). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail affecting the community.

The peak discharges for the Crawfish River were modified from those used in the Columbia County, Unincorporated Areas, Wisconsin Flood Insurance Study (Reference 5). The peak discharges were computed for that study at the Crawfish River at the Milford, Wisconsin gaging station using a log-Pearson Type III analysis. The discharges then were modified for use near Columbus using a drainage-area ratio procedure.

The peak discharges for the Maunesha River near Portland were computed using regional flood-frequency equations developed by Conger (Reference 6). They compared well with previously-computed discharges for an upstream site in the Dane County, Unincorporated Areas, Flood Insurance Study (Reference 7).

The peak discharges for Silver Creek upstream from Watertown were computed as part of the Watertown Flood Insurance Study (Reference 8). The discharges were computed using the Conger regional equations (Reference 6) and compared to similar gaged basins.

The peak discharges for Davy Creek near Ashippun were also computed using the Conger regional equations (Reference 6). The peak discharges for the Rock River at the mouth of Davy Creek were taken from the Jefferson County, Unincorporated Areas, Flood Insurance Study (Reference 9), and modified using a drainage-area ratio for the reach at the mouth of Davy Creek.

The peak discharges for the Rock River downstream from Horicon, Wisconsin, were computed using the Conger equations (Reference 6) at the County Highway S bridge site. These values have previously been reported in the Horicon Flood Insurance Study (Reference 10). These discharge values are now being reviewed by the WDNR as part of the Horicon study.

The peak discharges for the Rock River downstream from Hustisford were computed using a combination of methods for the reach below the dam. The dam was rated to establish a stage-discharge relation for Sinissippi Lake. A discharge-frequency curve was established for Wildcat Creek using a regional analysis of basin characteristics. A discharge-frequency curve was established for the Hustisford Dam using extensive historical data. The discharge from the dam was added to the Wildcat Creek discharge to find the total discharge for the study reach. This work was done as part of the Hustisford Flood Insurance Study (Reference 11) and reviewed by the WDNR.

On the Rock River, between Horicon and Hustisford, there is a decrease in peak discharges due to marshy and swampy storage areas along the overbank flooding.

Peak discharges for the East Branch Rock River downstream from Theresa, Wisconsin, were estimated using the Soil Conservation Service (SCS) TR-20 rainfall-runoff model (Reference 12). The model was calibrated against the continuous-gage record downstream at USGS gaging station site No. 05-4240 (located two miles northwest of Mayville at Kekosee Dam), discontinued in 1970.

Peak discharges for the East Branch Rock River upstream from Mayville, Wisconsin, were computed using a log-Pearson Type III procedure as outlined in the U.S. Water Resources Council (WRC) Bulletin No. 17A (Reference 13). A map skew was used in the analysis as per WRC guidelines. Gage site No. 05-4240 was used in the analysis. The site has a continuous record from 1950 through 1970 (21 years of record).

All discharge estimates not part of a previous incorporated area Flood Insurance Study have been transmitted to the WDNR as of January 3, 1979, for their review and approval.

Peak discharges for the 10-, 50-, 100-, and 500-year floods of each flooding source studied in detail in the community are shown in Table 1.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the streams in the community were carried out to provide estimates of the elevations of the floods of the selected recurrence intervals along each flooding source studied in detail.

Cross sections, bridge dam, and culvert geometry were obtained by field survey. Overbank cross sections for the Maunesha River were estimated from USGS topographic maps (Reference 14).

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 2).

Roughness factors (Manning's "n") were obtained from a previous U.S. Army Corps of Engineers (COE) report (Reference 15) and from field inspection and photographs taken by the Study Contractor.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA SQ MILES	PEAK DISCHARGES (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
CRAWFISH RIVER					
At Columbus, Wisconsin Millpond Dam	209	1,250	1,710	1,880	2,260
MAUNESHA RIVER					
Near Portland, Wisconsin, Highway 19 Bridge	94	1,090	1,890	2,300	3,460
SILVER CREEK					
At Watertown, Wisconsin, Mouth at Rock River	22	540	1,040	1,300	2,200
DAVY CREEK					
At Ashippun, Wisconsin, Lincoln Street Bridge	5.8	174	298	350	500
ROCK RIVER					
At County Highway S Bridge downstream from Horicon	462	2,700	3,700	4,200	5,200
At mouth of Wildcat Creek near Hustisford	554	3,000	3,400	3,600	4,100
EAST BRANCH ROCK RIVER					
At Theresa, Wisconsin, downstream corporate limits	140	1,060	1,810	2,410	4,040
At gage two miles northwest of Mayville	179	2,520	3,940	4,560	6,010

Roughness values are shown below.

Location	Roughness Coefficients	
	Channel	Overbank
Crawfish River	0.040	0.060 - 0.090
Maunesha River	0.020 - 0.025	0.070 - 0.160
Silver Creek	0.028 - 0.045	0.031 - 0.085
Davy Creek	0.035 - 0.080	0.040 - 0.110
East Branch Rock River		
(downstream from Theresa)	0.034 - 0.038	0.040 - 0.090
(upstream from Mayville)	0.035 - 0.038	0.030 - 0.125
Rock River		
(downstream from Horicon)	0.035	0.035 - 0.080
(downstream from Hustisford)	0.028 - 0.035	0.035 - 0.080

Starting water-surface elevations for the Crawfish River were obtained from a previous COE report which used a slope-conveyance method (Reference 15). Starting water-surface elevations for the Maunesha River were taken as the 10-year backwater level induced by the Crawfish River. This 10-year elevation was computed based on the known rating at the Milford, Wisconsin Gage Station, and by using the average slope of the Crawfish River (taking two bridges into consideration) upstream to the confluence with the Maunesha River.

For Silver Creek, the starting water-surface elevation was taken as the 10-year flood elevation of the Rock River at the mouth of Silver Creek within Watertown. The starting water-surface elevation for Davy Creek was taken as the 10-year flood elevation of the Rock River at the mouth of Davy Creek. The Rock River was studied in two reaches. For the reach located downstream of Horicon, the starting water-surface elevations were obtained by the slope-conveyance method downstream from the County Highway S bridge. For the reach downstream from Hustisford, the starting water-surface elevations were obtained from a slope-conveyance method downstream from the State Highway 60 bridge. Starting water-surface elevations on East Branch Rock River, also studied in two reaches, were obtained using the slope-conveyance method downstream from County Highway AY for the reach downstream from Theresa.

The lake levels for Fox Lake and Beaverdam Lake were taken from the previous COE Beaver Dam Flood Hazard Investigation (Reference 16) and written communication. The lake levels were computed using the HEC-1 rainfall-runoff model with a lake-routing option (Reference 17). The lake levels reported here are the peak levels resulting from the routing.

The lake levels for Sinissippi Lake were computed as being equivalent to the amount of backwater at Hustisford Dam from Rock River discharges. These lake levels are shown in Table 2 - Summary of Elevations.

The shoreline flood delineations for the above lakes reflect a calm pool condition. No account was made for wind setup, wave height, or wave runup.

TABLE 2 - SUMMARY OF ELEVATIONS

LOCATION	ELEVATIONS (NGVD) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
Sinissippi Lake	856.6	856.9	857.0	857.2
Fox Lake	890.9	891.6	892.0	892.7
Beaverdam Lake	871.9	872.6	872.9	873.5

Flood profiles were computed using the USGS E431 digital computer model (Reference 18) which employs the standard step-backwater method of analysis. Input data to the model consists of stream valley cross sections, bridge and embankment geometry, culvert geometry, channel roughness, and peak discharges. Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals (Exhibit 1).

Although Rock River in the vicinity of Davy Creek was not studied in detail as a part of this study, it was studied in the Jefferson County Flood Insurance Study (Reference 9). Data from the Jefferson County study indicates that the entire reach of Davy Creek flooding within Dodge County is dominated by backwater from the Rock River at a 100-year elevation of 848.5 feet. This elevation was used to insure compatibility between the two studies.

Also a portion of the Rock River's overbank flooding enters Dodge County north of the City of Watertown. The data for this reach is taken from the City of Watertown Flood Insurance Study (Reference 8).

For those streams studied by approximate methods the extent of flooding was determined using three methods.

First, the Dodge County Planning Department supplied 13 zoning maps (Reference 19) which delineated flood plain areas (FP) and Conservancy Districts (CO). These areas were determined via field inspection and inspection of soil survey data. The county requested that the 100-year approximate flood boundaries on the firm would coincide with the above-referenced county zoning maps.

Second, flood boundaries were determined by comparing flooding from detailed study areas with similar type drainage basins and then by transferring the flooding using USGS topographic maps (Reference 14), field inspection, and engineering judgement.

Third, the remaining flood boundaries were transferred from the published Flood Hazard Boundary Map (Reference 20).

The hydraulic analyses for this study are based only on the effects of unobstructed flow. The flood elevations as shown on the profiles are, therefore, considered valid only if hydraulic structures, in general, remain unobstructed and if channel and overbank conditions remain essentially the same as ascertained during this study.

All elevations are referenced from National Geodetic Vertical Datum of 1929 (NGVD); elevation reference marks used in the study are shown on the maps.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the FIA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100-year and the 500-year floods have been delineated using the elevations determined at each cross section; between cross sections the boundaries were interpolated using USGS topographic maps photoenlarged to a scale of 1:12000, with a contour interval of 10 feet from the computed water-surface elevations (Reference 14).

Streams studied by approximate methods were also delineated on the above-referenced county zoning maps and topographic maps, other streams designated on the maps as approximate study areas were obtained directly from the previously published Flood Hazard Boundary Map (Reference 20).

The boundaries of the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map (Exhibit 2). Small areas within the flood boundaries may lie above the flood elevations and, therefore, not be subject to flooding; owing to lack of detailed topographical information or to limitations of the map scale, such areas are not shown. In cases where the 100-year and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights. Minimum standards of the FIA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. However, the Wisconsin Department of Natural Resources has established a policy that limits encroachment in the flood plain to 0.1 foot (Reference 21).

Natural flood profiles were calculated using the equal conveyance reduction and the available effective flow areas. Floodway boundaries, due to the limiting low surcharge and topographic characteristics, are equivalent to the 100-year flood boundary, except for areas that have no conveyance. The results of these analyses were tabulated at each cross section and are shown in Table 3.

Portions of the floodways extend within incorporated communities and beyond county limits.

As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway boundaries were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 0.1 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
ROCK RIVER								
A	283.28	460/180[2]	2130	1.7	849.0	849.0	849.0	0.0
B	283.40	570	1980	1.8	849.1	849.1	849.1	0.0
C	283.48	540	2150	1.7	849.2	849.2	849.2	0.0
D	290.35	140	900	4.7	857.2	857.2	857.2	0.0
E	292.33	300/160[2]	1500	2.9	857.2	857.2	857.2	0.0
EAST BRANCH ROCK RIVER								
A	14.54	410	2020	2.2	921.9	921.9	921.9	0.0
B	14.75	250	1800	2.5	922.3	922.3	922.3	0.0
C	15.69	280	1330	3.4	923.2	923.2	923.2	0.0
D	15.87	180	1270	3.6	923.8	923.8	923.8	0.0
E	16.06	550	3250	1.4	924.2	924.2	924.2	0.0
F	16.24	320	1900	2.4	924.3	924.3	924.3	0.0
G	16.48	260	1130	4.0	924.7	924.7	924.7	0.0
H	16.67	220	1020	4.5	925.7	925.7	925.7	0.0
I	22.44	540	1440	1.7	931.4	931.4	931.4	0.0
J	22.68	440	1520	1.6	931.8	931.8	931.8	0.0
K	22.72	450	1160	2.1	931.8	931.8	931.8	0.0

[1]MILES ABOVE MOUTH
[2]TOTAL WIDTH / WIDTH WITHIN UNINCORPORATED DODGE COUNTY

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF DODGE, WI
(UNINCORPORATED AREAS)

FLOODWAY DATA

ROCK RIVER - EAST BRANCH ROCK RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
CRAWFISH RIVER								
A	31.56	340	1060	1.8	824.5	824.5	824.5	0.0
B	31.83	200	1020	1.8	824.8	824.8	824.8	0.0
C	32.04	260	973	1.9	825.0	825.0	825.0	0.0
D	32.30	260	804	2.3	825.6	825.6	825.6	0.0
E	32.77	210	1270	1.5	831.4	831.4	831.4	0.0
F	32.83	200	1230	1.5	831.5	831.5	831.5	0.0
G	34.01	350	1410	1.3	833.2	833.2	833.2	0.0
H	34.48	440	1310	1.4	833.6	833.6	833.6	0.0
I	34.73	125	901	2.1	833.9	833.9	833.9	0.0
J	34.80	175	996	1.9	833.9	833.9	833.9	0.0
K	35.65	325	1380	1.4	834.7	834.7	834.7	0.0
L	35.83	140	1020	1.8	834.8	834.8	834.8	0.0
MAUNESHA RIVER								
A	3.35	220	656	3.5	794.7	794.7	794.7	0.0
B	3.70	560	1060	2.2	795.6	795.6	795.6	0.0
C	3.84	220	592	3.9	795.8	795.8	795.8	0.0
D	3.93	270/140[2]	692	3.3	796.1	796.1	796.1	0.0
SILVER CREEK								
A	0.63	470/410[2]	985	1.3	813.4	813.4	813.4	0.0
B	0.78	470	882	1.5	813.8	813.8	813.8	0.0
C	0.96	510	946	1.4	814.6	814.6	814.6	0.0
D	1.09	350	531	2.4	815.2	815.2	815.2	0.0
E	1.13	410	828	1.6	816.9	816.9	816.9	0.0
F	1.27	900	2100	0.6	817.0	817.0	817.0	0.0
G	1.36	450	1020	1.3	817.1	817.1	817.1	0.0

[1]MILES ABOVE MOUTH
[2]TOTAL WIDTH / WIDTH WITHIN UNINCORPORATED DODGE COUNTY

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF DODGE, WI
(UNINCORPORATED AREAS)

FLOODWAY DATA

CRAWFISH RIVER - MAUNESHA RIVER - SILVER CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY[2] (NGVD)	WITHOUT FLOODWAY[3] (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
DAVY CREEK								
A	0.74	1190	3520	0.1	848.5	845.9	845.9	0.0
B	1.02	1280	839	0.4	848.5	846.0	846.0	0.0
C	1.37	750	762	0.5	848.5	847.2	847.2	0.0
D	1.49	510	898	0.4	848.5	847.4	847.4	0.0
E	1.74	560	631	0.6	848.5	847.6	847.6	0.0
F	1.93	770	844	0.4	848.5	847.8	847.8	0.0

[1]MILES ABOVE MOUTH
[2]ELEVATIONS FROM JEFFERSON, WISCONSIN FIS
[3]ELEVATIONS WITHOUT CONSIDERING BACKWATER EFFECT FROM ROCK RIVER

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF DODGE, WI
(UNINCORPORATED AREAS)

FLOODWAY DATA

DAVY CREEK

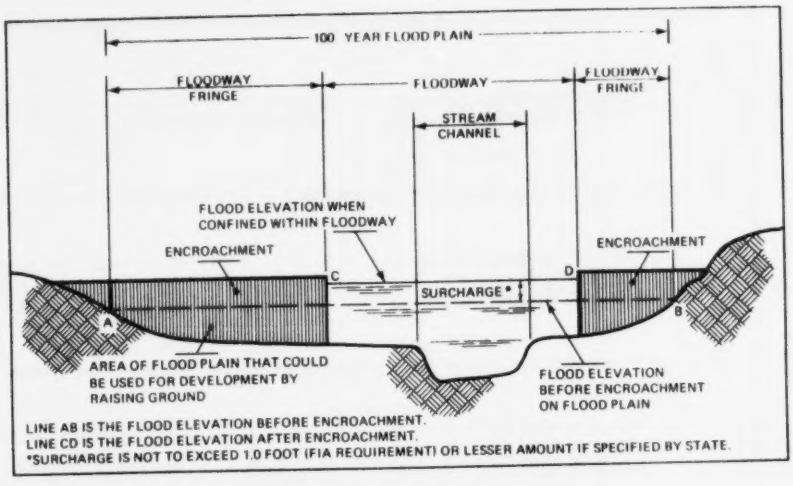

100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT.
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT.
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FIA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FIGURE 2 - Floodway Schematic

The floodways in this report are recommended to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the FIA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHF), and flood insurance zone designations for each flooding source affecting the County of Dodge.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference Between 10- and 100-year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the County of Dodge are shown on the Flood Profiles (Exhibit 1) and are summarized in the Flood Insurance Zone Data Table (Table 4).

5.2 Flood Hazard Factors

The FHF is used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest 0.5 foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire unincorporated areas of the County of Dodge was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations are shown or FHFs determined.
Zones A1-A5:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations are shown, and zones subdivided according to FHF.
Zone B:	Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; or areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

Table 4, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the County of Dodge is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the FIA.

6.0 OTHER STUDIES

As has been mentioned previously, numerous Flood Insurance Studies provided information for this report (References 5, 7, 8, 9, 10, 11, 22, 23, and 24). This report was coordinated and is in agreement with all such adjacent studies except in the following instances.

The Columbia County, Unincorporated Areas, study (Reference 5) included a reach of the Crawfish River near Columbus, Wisconsin, as an approximate study area. It does not agree with this report and is accounted for by the use of new and more detailed contour maps, and the use of detailed study methods in the area.

The Hustisford Flood Insurance Study (Reference 11) used a base map prepared by the Dodge County Planning and Development Department, which is less accurate and has been superseded by the maps (Reference 14) used in this study. As a result, some stream stationings used in the floodway data tables and profiles for the Rock River differ from those for identical locations in the Hustisford report by as much as 0.05 mile.

A 1975 COE Flood Hazard Investigation report (Reference 16) and written communication were used to determine the Fox Lake and Beaver Dam Lake pool elevation and therefore are in agreement with this study.

The 1976 Flood Hazard Investigation of Columbus, Wisconsin (Reference 15) provided the cross section data and hydraulic model used to compute the water-surface profile of the Crawfish River near Columbus, Wisconsin, and therefore is in agreement with this study.

A Flood Hazard Boundary Map has been published by the Federal Insurance Administration (Reference 20). The differences between the Flood Hazard Boundary Map and this study are justified due to the more detailed nature of this Flood Insurance Study.

This report either supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for the purposes of the National Flood Insurance Program.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
ROCK RIVER							
REACH 1[4]	0195	–1.5	–0.5	1.0	015	A3	812
REACH 2	0140	–0.7	–0.2	0.5	005	A1	VARIES–SEE MAP
REACH 3	0110	–0.6	–0.2	0.4	005	A1	VARIES–SEE MAP
EAST BRANCH ROCK RIVER							
REACH 1	0055,0085	–2.4	–0.6	1.3	025	A5	VARIES–SEE MAP
REACH 2	0060	–2.1	–0.9	1.1	020	A4	VARIES–SEE MAP
CRAWFISH RIVER							
REACH 1	0125	–1.3	–0.3	0.6	015	A3	VARIES–SEE MAP
MAUNESHA RIVER							
REACH 1	0185	–1.9	–0.5	1.1	020	A4	VARIES–SEE MAP

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT
[4]DATA FOR THIS REACH TAKEN FROM CITY OF WATERTOWN, WISCONSIN FIS

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF DODGE, WI
(UNINCORPORATED AREAS)

FLOOD INSURANCE ZONE DATA

ROCK RIVER - EAST BRANCH ROCK RIVER - CRAWFISH RIVER - MAUNESHA RIVER -

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
SILVER CREEK REACH 1	0195	–1.4	–0.4	1.7	015	A3	VARIES–SEE MAP
DAVY CREEK BACKWATER REACH[4]	0200,0205	–2.3	–0.8	2.6	025	A5	849
SINISSIPPI LAKE REACH 1	0105,0110,0140	–0.4	–0.1	0.2	005	A1	857
FOX LAKE REACH 1	0005,0010 0035,0040	–1.1	–0.4	0.7	010	A2	892
BEAVER DAM LAKE REACH 1	0035,0040 0065,0070	–1.0	–0.3	0.6	010	A2	873

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT
[4]DATA FOR THIS REACH TAKEN FROM CITY OF JEFFERSON COUNTY, WISCONSIN FIS

TABLE

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF DODGE, WI
(UNINCORPORATED AREAS)

FLOOD INSURANCE ZONE DATA

SILVER CREEK - DAVY CREEK - SINISSIPPI LAKE - FOX LAKE - BEAVER DAM LAKE

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic and other pertinent data used in this study can be obtained by contacting the Insurance and Mitigation Division, Federal Emergency Management Agency, One North Dearborn Street, Chicago, Illinois 60602.

8.0 REFERENCES AND BIBLIOGRAPHY

1. Wisconsin Department of Administration, Demographic Services Center, Official Population Estimates for 1978, October 1978.

2. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Monthly Normals of Temperature, Precipitation, and Heating and Cooling Degree Days 1941-70, August 1973.

3. Hole, Francis D., Soils of Wisconsin, The University of Wisconsin Press, 1976.

4. Wisconsin Department of Natural Resources, Surface Water Resources of Dodge County, L.T. Kernen, R.J. Poff, and C.W. Threinen, 1965.

5. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Columbia County, Unincorporated Areas, Wisconsin, March 1979.

6. U.S. Geological Survey, Open-File Report, Estimating Magnitude and Frequency of Floods in Wisconsin, Duane H. Conger, 1971.

7. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Dane County, Unincorporated Areas, Wisconsin, September 1978.

8. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, City of Watertown, Wisconsin, (in progress).

9. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Jefferson County, Unincorporated Areas, September 1978.

10. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, City of Horicon, Wisconsin, (in progress).

11. ----------, Flood Insurance Study, Village of Hustisford, Wisconsin, (in progress).

12. U.S. Department of Agriculture, Soil Conservation Service, Technical Release No. 20, Computer Program for Project Formulation Hydrology, 1965.

13. U.S. Water Resources Council, Bulletin No. 17A, Guidelines for Determining Flood Flow Frequency, June 1977.

14. U.S. Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:24000, Contour Interval 10 feet: Beaver Dam NE, Wisconsin (1978 advance print); Beaver Dam NW, Wisconsin (1978 advance print); Beaver Dam SW, Wisconsin (1978 advance print); Fox Lake SE, Wisconsin (1978 advance print); Hartford West, Wisconsin (1959); Horicon NE, Wisconsin (1978 advance print); Horicon NWN, Wisconsin (1978 advance print); Horicon SE, Wisconsin (1978 advance print); Ixonia, Wisconsin (1959); Watertown Wisconsin (1959); Waupun SE, Wisconsin (1978 advance print);Waupun SW, Wisconsin (1978 advance print).

15. U.S. Army Corps of Engineers, Flood Hazard Investigation, City of Columbus, Wisconsin, 1976.

16. ----------, Flood Hazard Investigation, City of Beaver Dam, Wisconsin, July 1975.

17. ----------, Computer Program No. 723-X6-L2010, HEC-1 Flood Hydrograph Package, January 1973.

18. U.S. Geological Survey, Computer Program E431, Open-File Report 76-499, Computer Applications for Step-Backwater and Floodway Analyses, J.O. Shearman, 1976.

19. Dodge County Planning Department, Zoning Maps for the Towns of Fox Lake, Calumus, Elba, Portland, Beaver Dam, Burnet, Oak Grove, Emitt, Hustisford, Lebanon, Herman, Rubicon, and Ashippun, Scales 1:15996.

20. U.S. Department of Housing and Urban Development, Flood Insurance Administration, Flood Hazard Boundary Map, Dodge County, Unincorporated Areas, Wisconsin, February 1979.

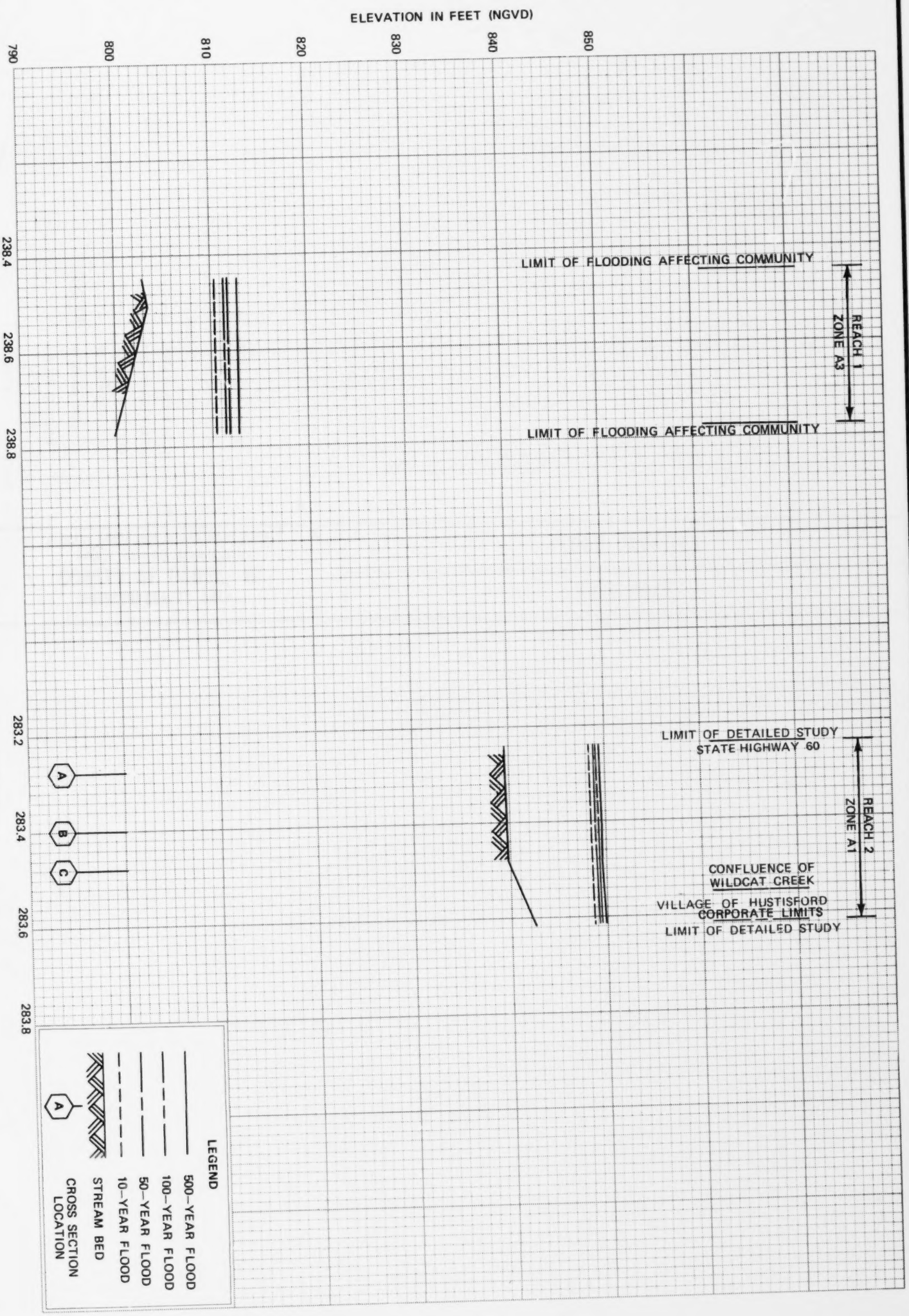
21. Wisconsin Department of Natural Resources, Wisconsin's Flood Plain Management Program, Chapter NR 116, Register No. 259, 1977.

22. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, City of Theresa, Wisconsin, October 1978.

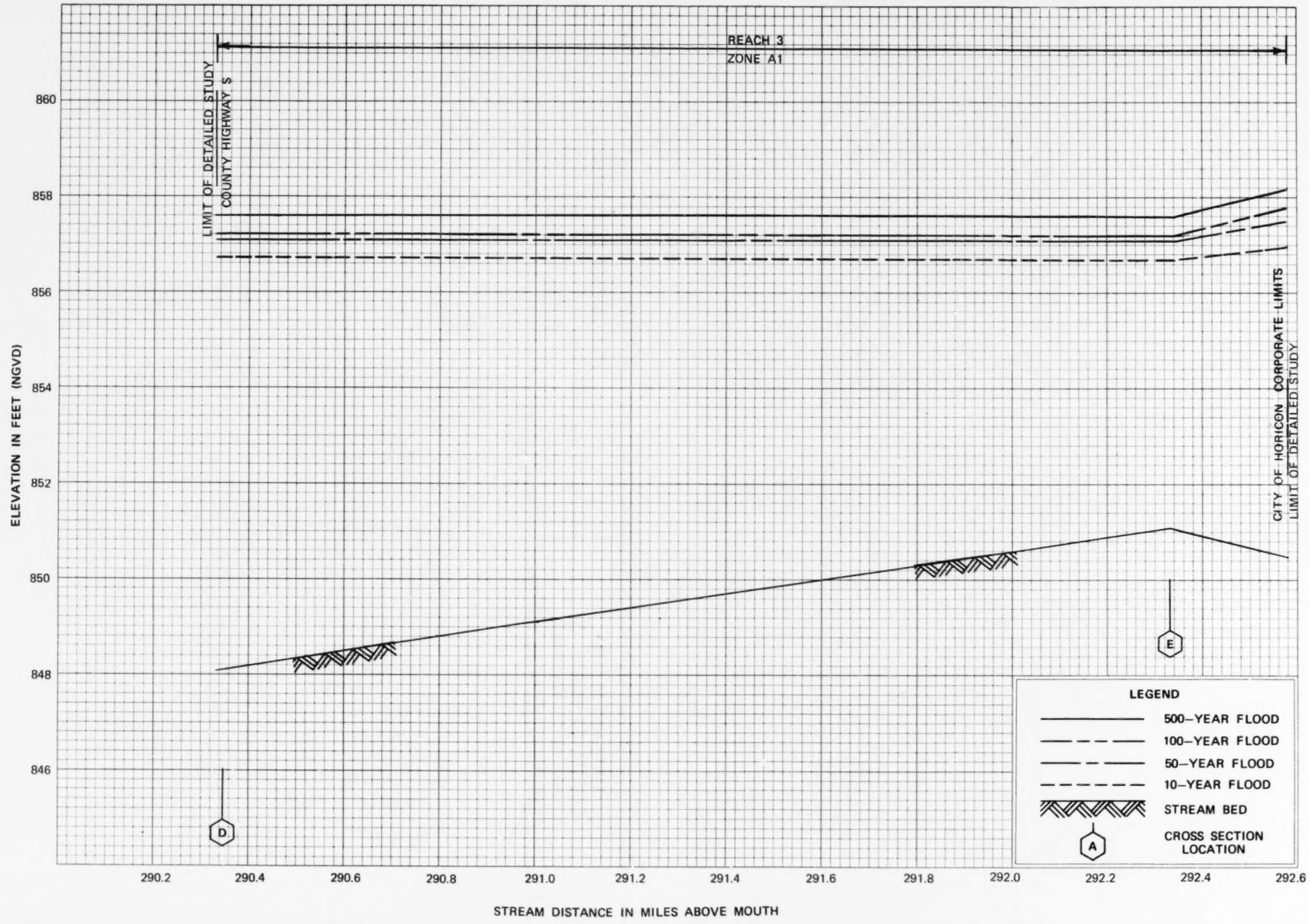
23. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, City of Mayville, Wisconsin, (in progress).

24. ----------, Flood Insurance Study, City of Fox Lake, Wisconsin, (in progress).

U.S. Geological Survey, Techniques of Water Resources Investigations, Book 3, Chapter A5, "Measurement of Peak Discharge at Dams by Indirect Methods," 1968.



01P	FEDERAL EMERGENCY MANAGEMENT AGENCY Federal Insurance Administration **COUNTY OF DODGE, WI** (UNINCORPORATED AREAS)	**FLOOD PROFILES** **ROCK RIVER**

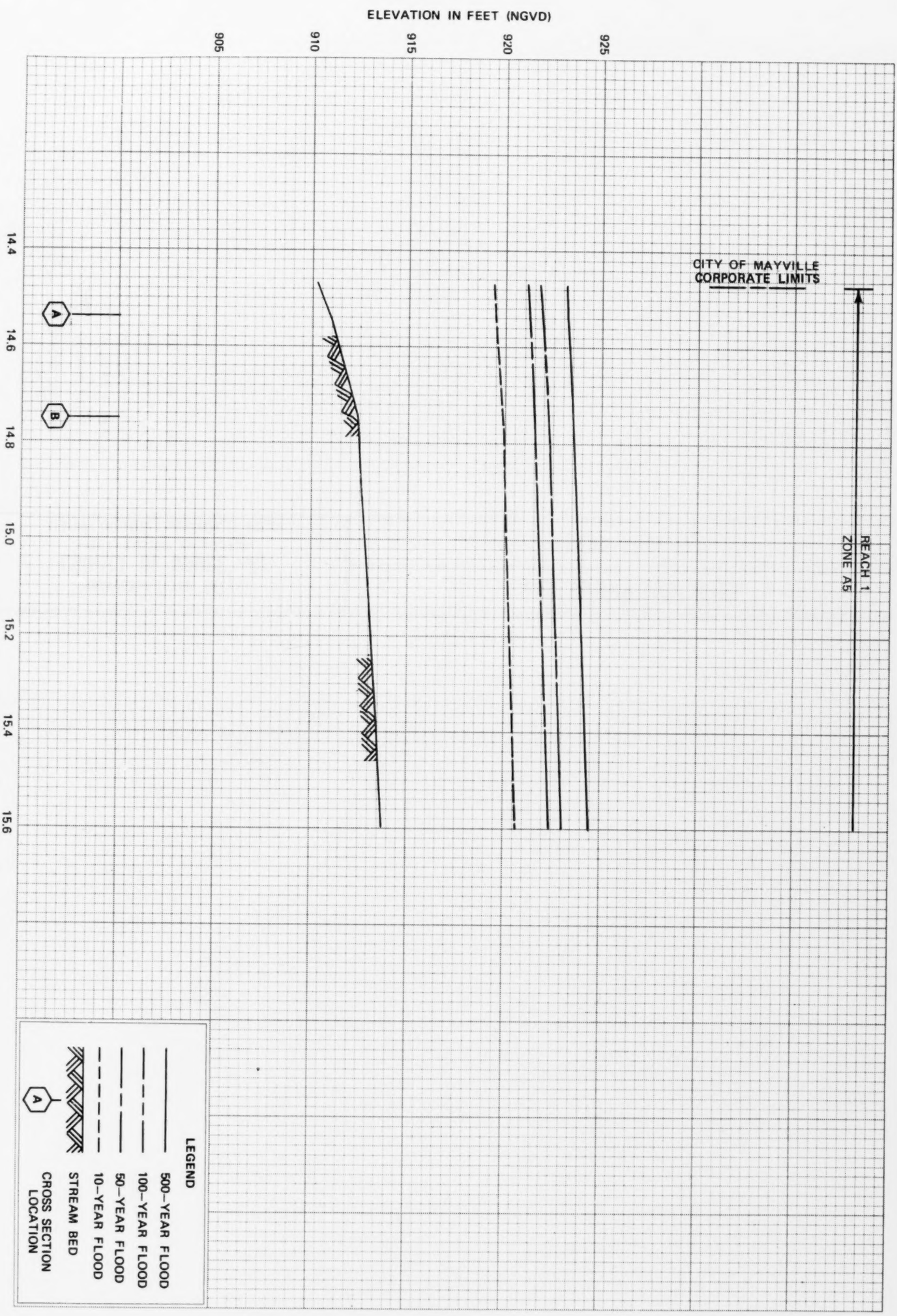


FLOOD PROFILES

ROCK RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF DODGE, WI
(UNINCORPORATED AREAS)

02P

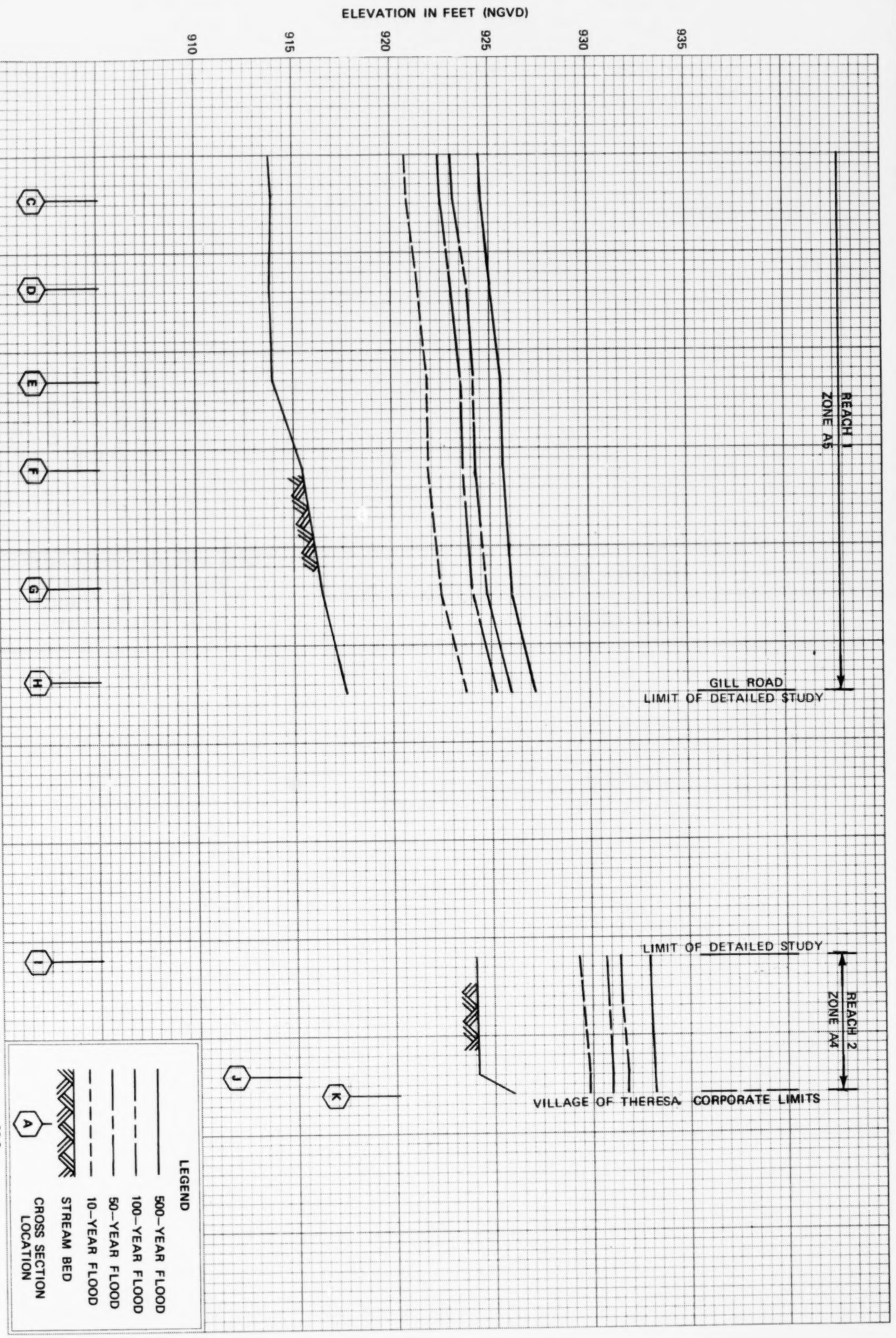


03P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF DODGE, WI
(UNINCORPORATED AREAS)

FLOOD PROFILES

EAST BRANCH ROCK RIVER

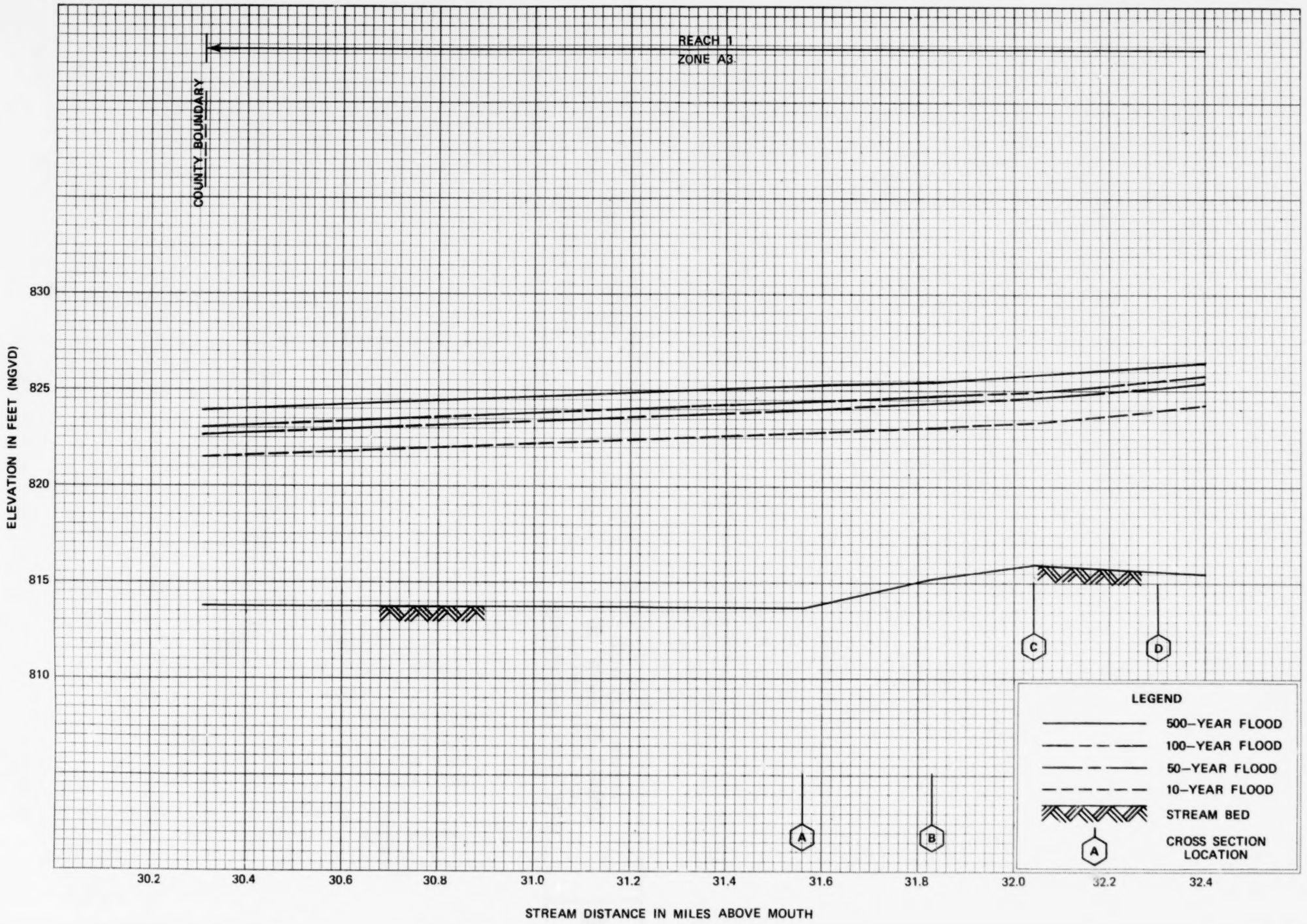


FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF DODGE, WI
(UNINCORPORATED AREAS)

FLOOD PROFILES

EAST BRANCH ROCK RIVER

04P

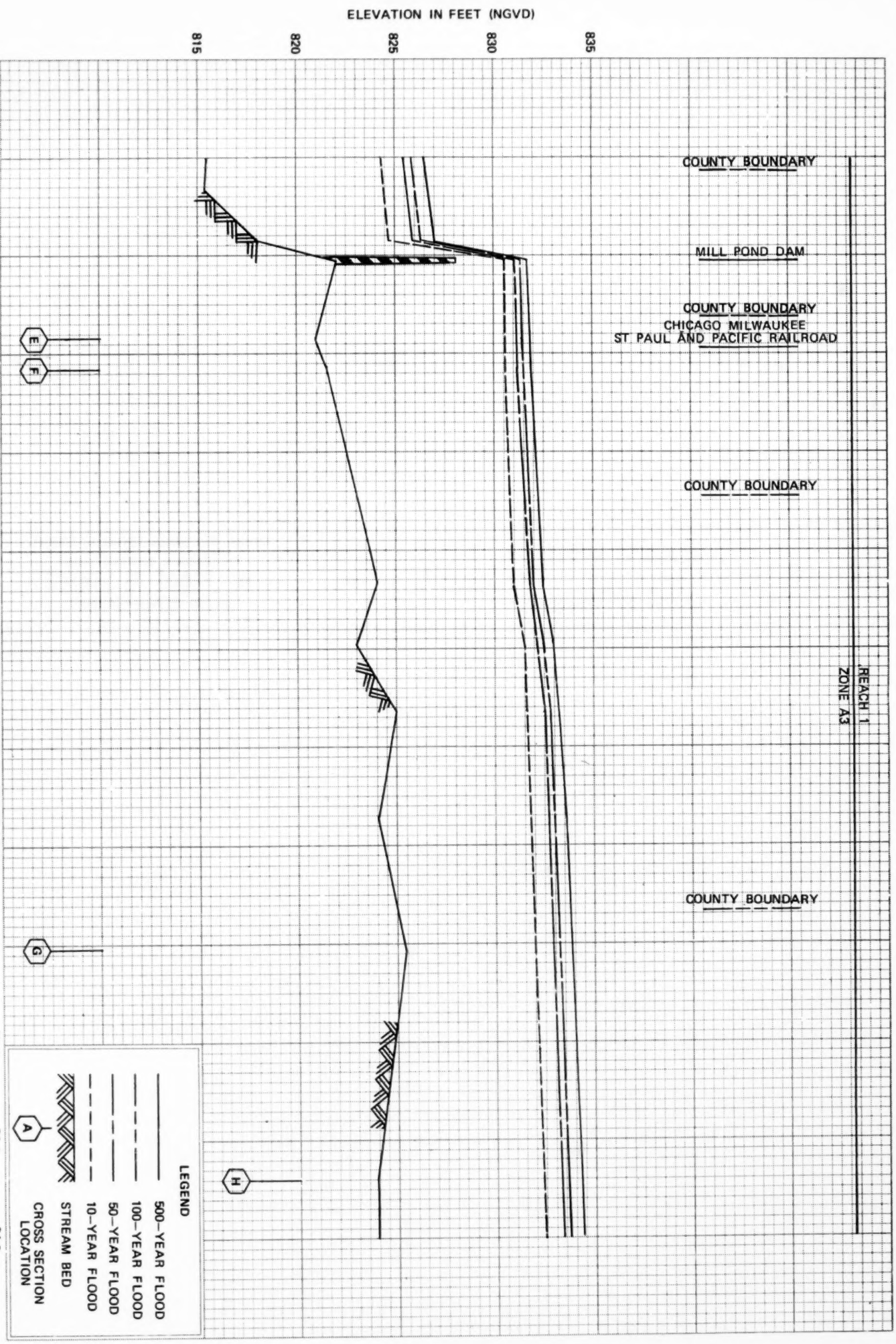


FLOOD PROFILES

CRAWFISH RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF DODGE, WI
(UNINCORPORATED AREAS)

05P



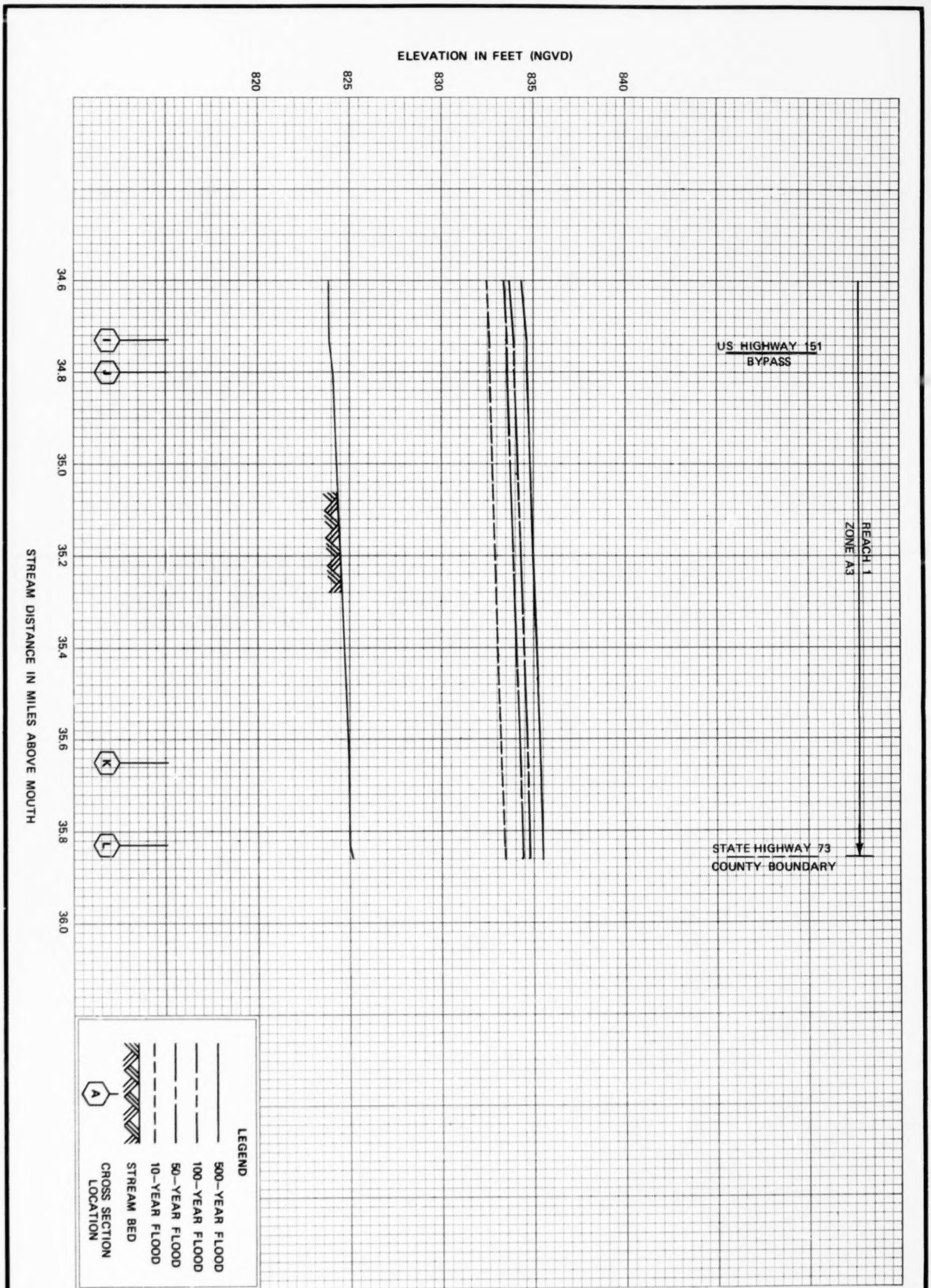
06P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF DODGE, WI
(UNINCORPORATED AREAS)

FLOOD PROFILES

CRAWFISH RIVER

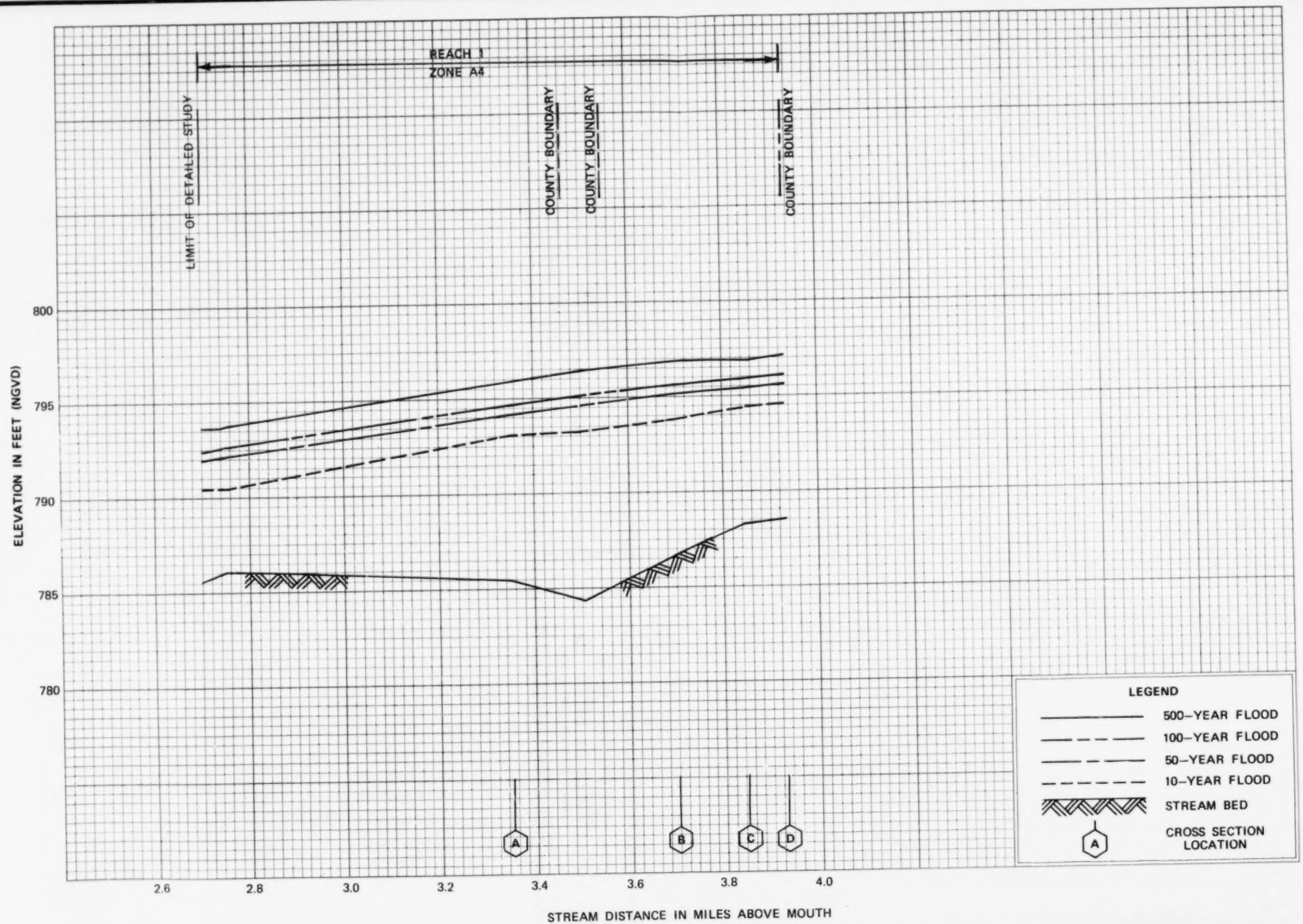


07P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF DODGE, WI
(UNINCORPORATED AREAS)

FLOOD PROFILES

CRAWFISH RIVER



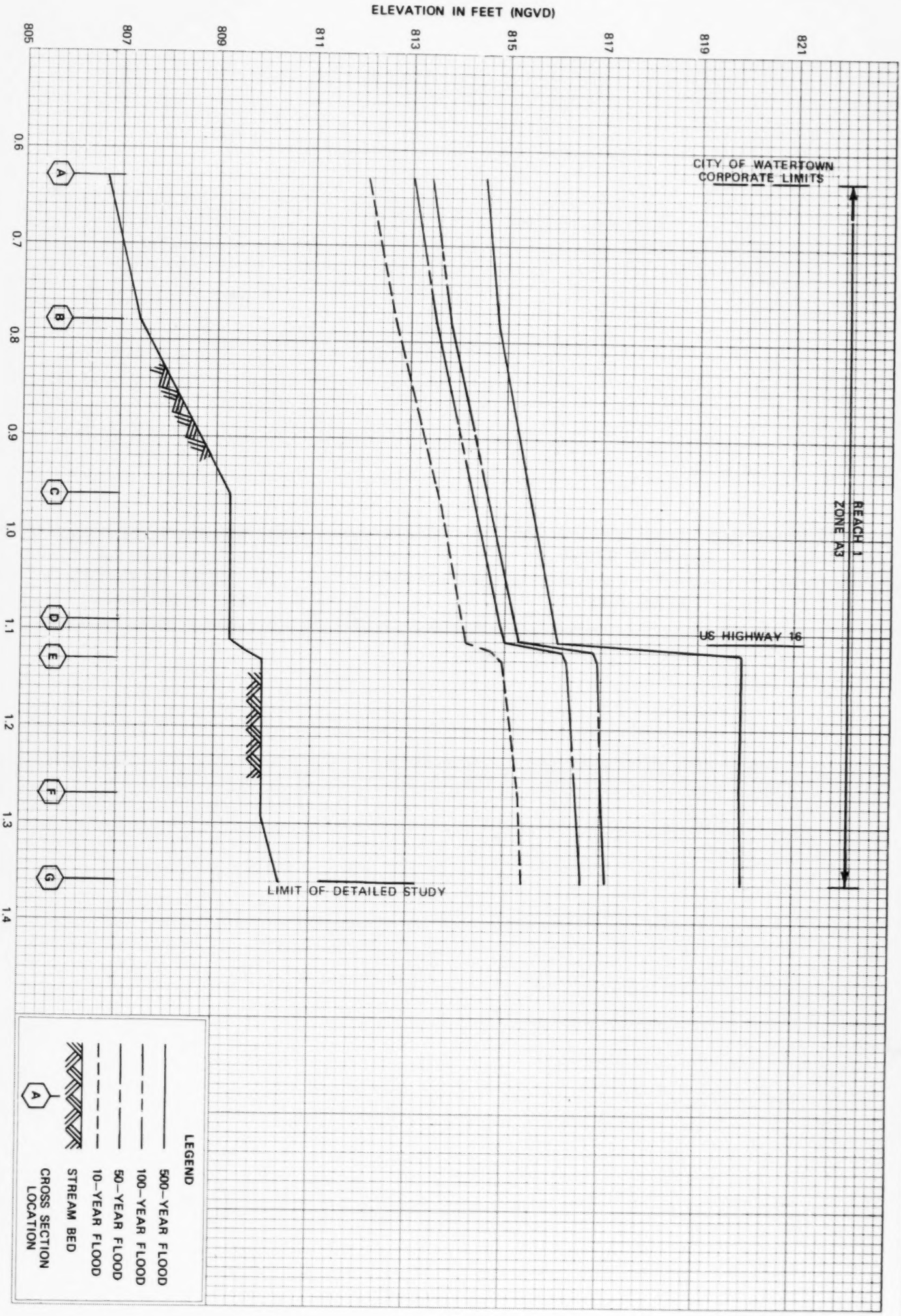
FLOOD PROFILES

MAUNESHA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

COUNTY OF DODGE, WI
(UNINCORPORATED AREAS)

08P

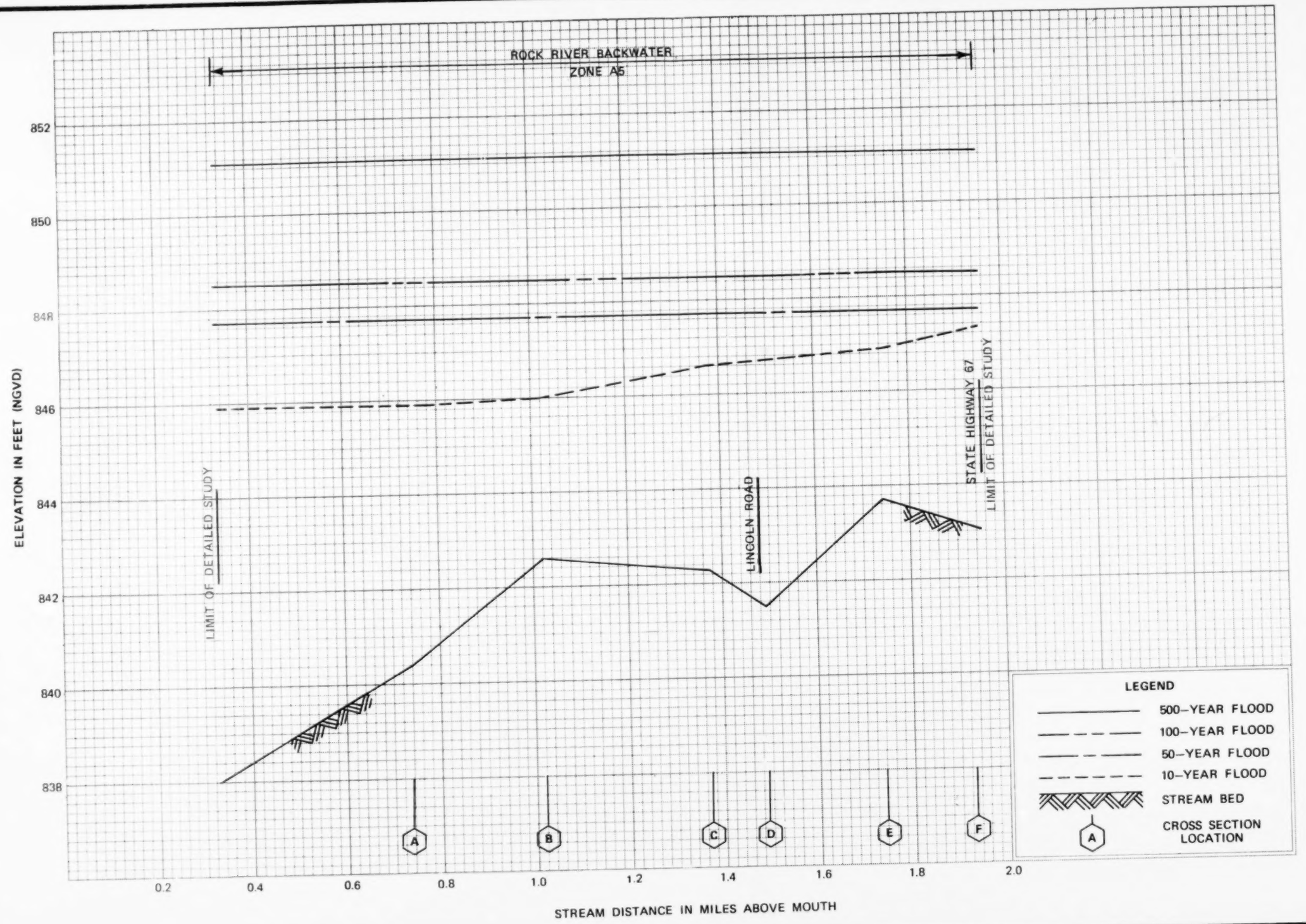


09P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF DODGE, WI
(UNINCORPORATED AREAS)

FLOOD PROFILES

SILVER CREEK



FLOOD PROFILES

DAVY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration
COUNTY OF DODGE, WI
(UNINCORPORATED AREAS)

10P